



Peoples Gas & North Shore Gas Market Potential Study

Date: September 3, 2024

Prepared for: Illinois Energy Efficiency SAG



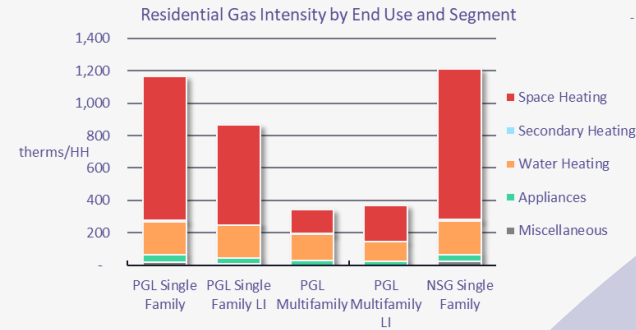
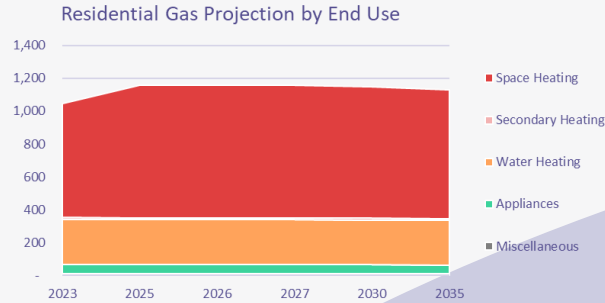
Topics



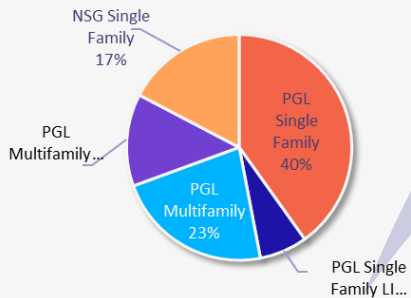
- ✔ Overview of Analysis Approach
- ✔ Primary Data Sources
- ✔ Levels of Savings & Adoption Rates
- ✔ Market Characterization and Baseline
 - Code Impacts
- ✔ Peoples Gas and North Shore Gas Draft Potential
 - Overall Residential and Commercial potential
 - Savings by case and select years
 - Top measures – Realistic Achievable Potential
 - Top measures – Technical Comparison
- ✔ Key Takeaways
- ✔ Planned Sensitivity Scenarios



Potential Study Modeling Approach



Residential Gas Use by Segment, 2023



Market Characterization

- Baseline studies
- Utility data
- Secondary data

Baseline Projection

- Utility forecasts
- Standards and building codes

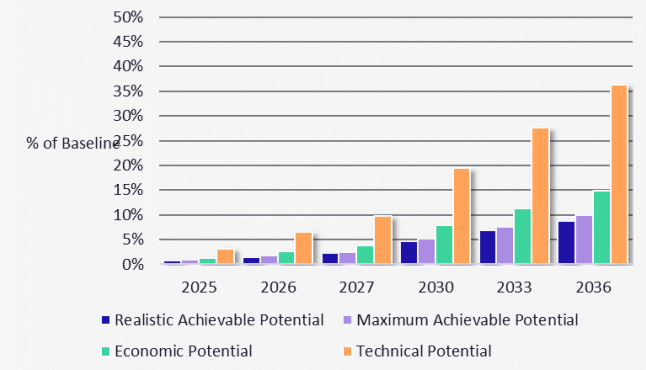
Identify Demand-Side Resources

- EE equipment
- EE measures
- Emerging tech.

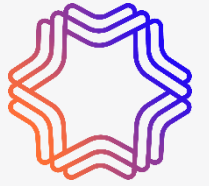


Potential Estimation

- Technical
- Economic
- Achievable



Major Modeling Inputs and Sources



Peoples/North Shore foundational data

PGL/NSG gas 2023 sales by schedule
Current and forecasted customer counts
Retail price forecasts
Program & pilot data
Economic assumptions (avoided costs, discount rate, carbon value, etc.)
Previous potential study



Survey data showing presence of equipment

PGL: Implementation data
US Energy Information Administration: Residential, Commercial, and Manufacturing Energy Consumption Surveys (RECS 2020, CBECS 2018, and MECS 2015)



Technical data on end-use equipment costs and energy consumption

Illinois TRM (v12 primarily)
US Department of Energy and ENERGY STAR technical data sheets
Energy Information Administration's Annual Energy Outlook/National Energy Modeling System data files



State and Federal energy codes and standards

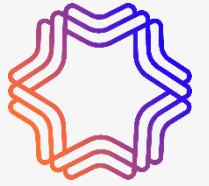
Illinois State Energy Code
Federal energy standards by equipment class



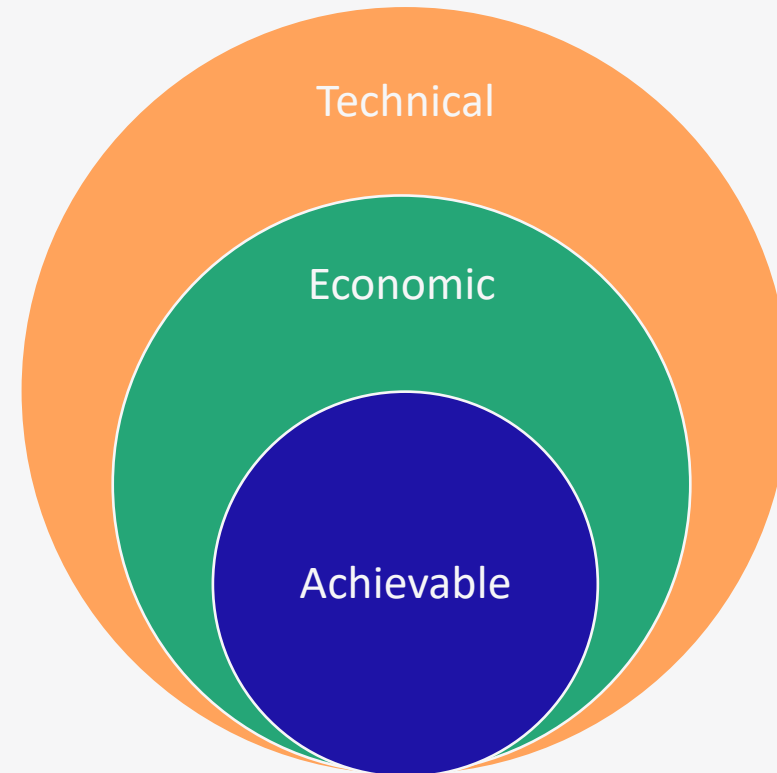
Market trends and effects

Annual Energy Outlook purchase trends
ENERGY STAR sales data

Levels of Savings



- ✓ **Technical:** At every opportunity, customers choose the most efficient option regardless of cost
- ✓ **Economic:** Includes only cost-effective measures, but assumes 100% of customers participate
 - This study uses the Total Resource Cost test (TRC)
- ✓ **Achievable:** A subset of economic potential that accounts for likely measure adoption within the market
 - Requires forecasts of adoption rates
 - AEG modeled two levels of achievable potential:
 - **Realistic** achievable potential reflects current customer willingness to participate and incentives consistent with current programs
 - **Maximum** achievable potential applies a “lift” factor to the base adoption rates, representing maximum incentives and customers’ ideal program delivery

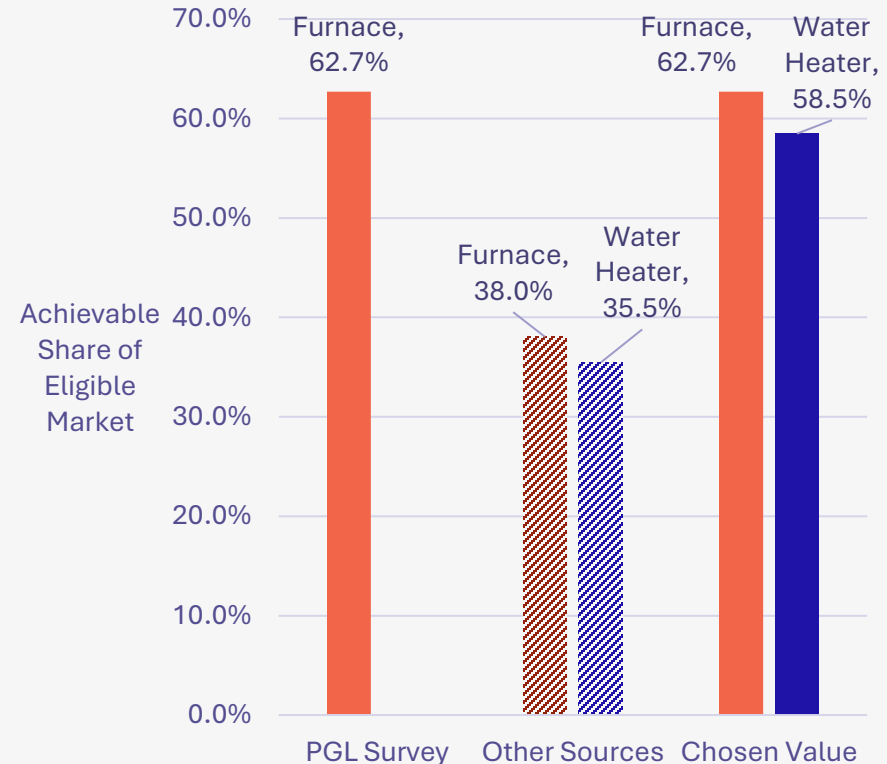


Adoption Rates

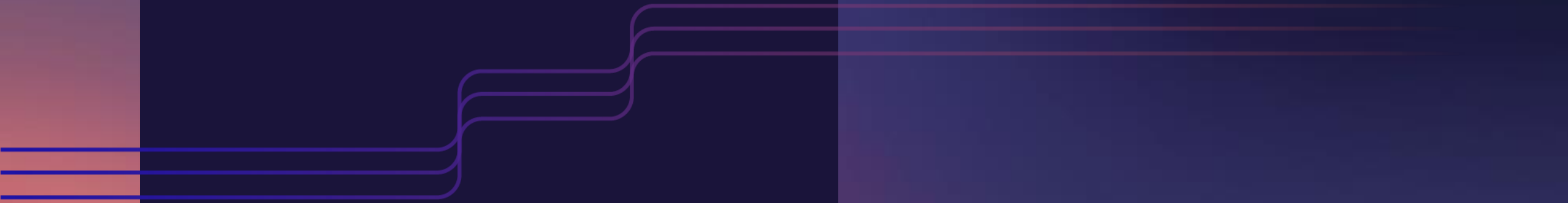


Methods and example

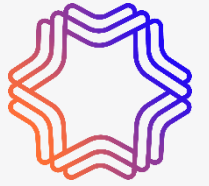
- ✔ Market research from the previous potential study included residential customer willingness-to-participate
 - Furnaces were tested with varying incentive amounts and payback periods (see previous study report for documentation)
 - Customers were also asked about a hypothetical 100% incentive, direct-install weatherization upgrade, which sets a strong maximum participation level
- ✔ Measures not included in the previous research (including C&I) were assigned adoption rates derived from prior AEG studies elsewhere, but scaled to be in proportion to the Peoples Gas/North Shore Gas research (see right)



Market Characterization and Baseline



Market Characterization



Peoples Gas and North Shore Gas

Natural Gas Consumption by Sector in 2023 (Million therms)

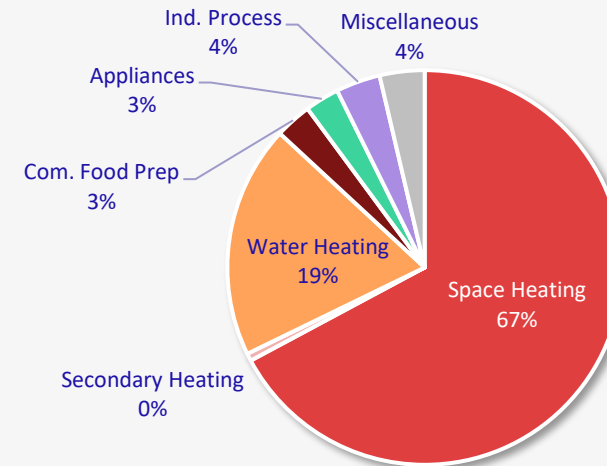
	Peoples Gas	North Shore Gas	Total
Residential	864	181	1,045
Commercial	588	124	712
Industrial	78	32	110
Total	1,529	337	1,866

- ✔ Peoples Gas and North Shore Gas loads are majority residential (56%)
- ✔ Majority of customers use gas for both space heating and water heating
- ✔ Other end uses, including Industrial process account for just ~14% of gas loads

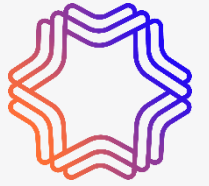
Natural Gas Use by Sector (2023)



All Sector Natural Gas Consumption by End Use, 2023



Residential Market Characterization



Residential Totals by Segment

Segment	2023 Gas Use (Million therms)	Households	therms/HH	% of Annual Use
PGL Single Family*	419	359,832	1,165	40.1%
PGL Single Family LI*	72	82,975	864	6.9%
PGL Multifamily	235	684,463	343	22.5%
PGL Multifamily LI	138	372,980	370	13.2%
NSG Single Family	181	149,449	1,212	17.3%
Total	1,045	1,649,699	3,954	100%

✔ Residential space and water heating saturations taken from joint utility implementation assessments.

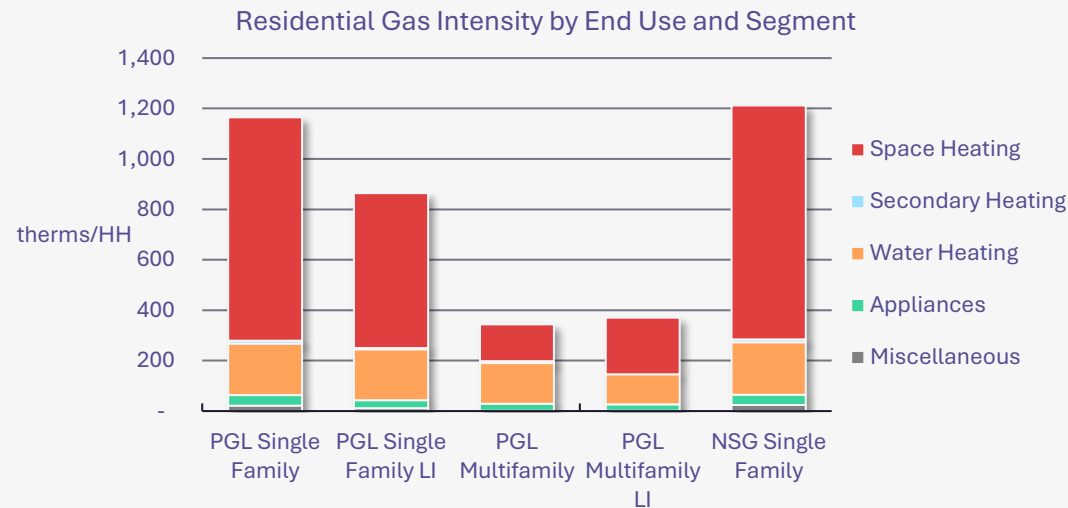
- Values compare well with the federal Residential Energy Consumption Survey (RECS) 2020 data for Illinois when filtered for natural gas customers

✔ Initial values for gas consumption by individual technologies comes from a mix of building simulations and technical data from the Energy Information Administration

- Prior market research was used to inform building characteristics for simulation

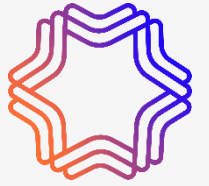
✔ Use per customer is calibrated to actual bill data.

- This ensures derived savings include the impacts from the current efficiency mix and real behavior of customers



* To save space, this table abbreviates Peoples Gas to 'PGL', North Shore Gas to 'NSG', Low Income to 'LI', and Households to 'HH'

Commercial Market Characterization



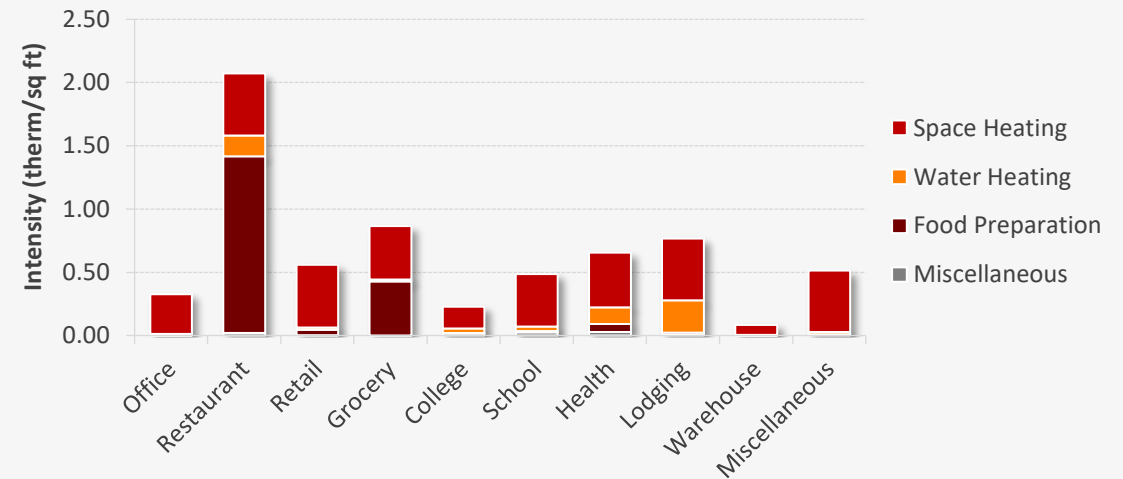
Commercial Totals by Segment

Segment	Peoples Gas (Thousand therms)	North Shore Gas (Thousand therms)	Total (Thousand therms)	% of Commercial
Office	84,829	17,582	102,410	14%
Restaurant	31,921	7,922	39,844	6%
Retail	23,775	11,757	35,531	5%
Grocery	12,888	4,256	17,144	2%
College	41,892	6,057	47,950	7%
School	94,896	17,594	112,490	16%
Health	139,365	29,436	168,801	24%
Lodging	52,231	1,772	54,003	8%
Warehouse	5,125	3,192	8,318	1%
Miscellaneous	100,937	24,362	125,299	18%
Total	587,859	123,931	711,790	100%

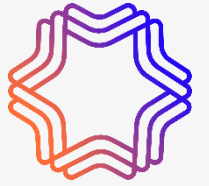
✓ Primary source for breaking commercial gas loads down comes from the federal Commercial Building Stock Assessment (CBECS) 2018 data

- Overall therms per square feet
- End use and technology saturations
- Age and size of buildings to inform simulations

Commercial Intensity by Segment and End Use



Industrial Market Characterization

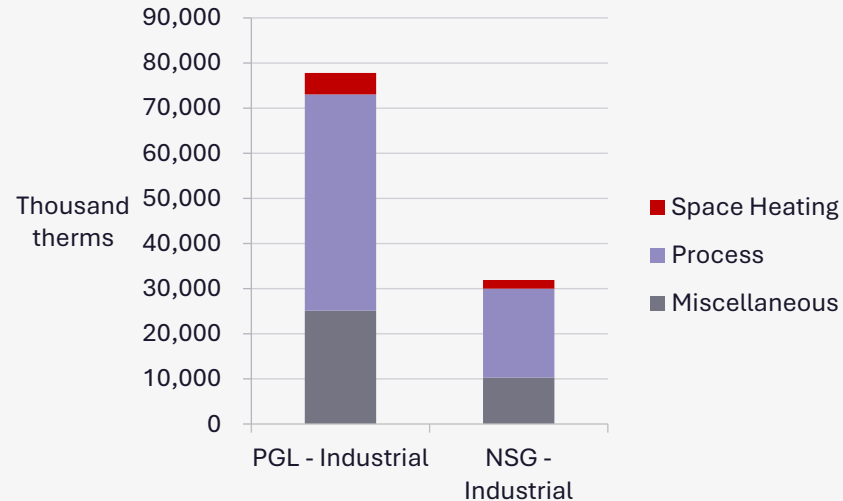


Industrial Totals by Segment

End Use	Peoples Gas (Thousand therms)	North Shore Gas (Thousand therms)	Total
Space Heating	4,719	1,940	6,659
Process	47,915	19,695	67,609
Miscellaneous	25,118	10,324	35,443
Total	77,752	31,959	109,711

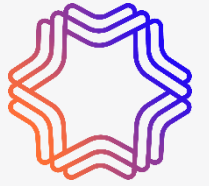
- ✓ Previous potential study (2020) included Industrial within Commercial, but some additional insight is gained in separating it
 - However, the loads are too small to meaningfully break individual segments/manufacturing types

Industrial Consumption by Segment and End Use



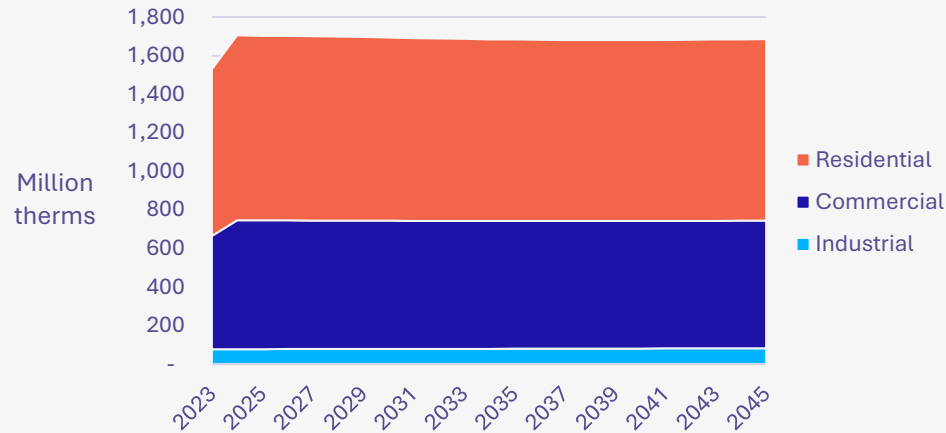
- ✓ Data from the 2019 Manufacturing Energy Consumption Survey (MECS) helps break industrial gas loads into end uses

Baseline Projection

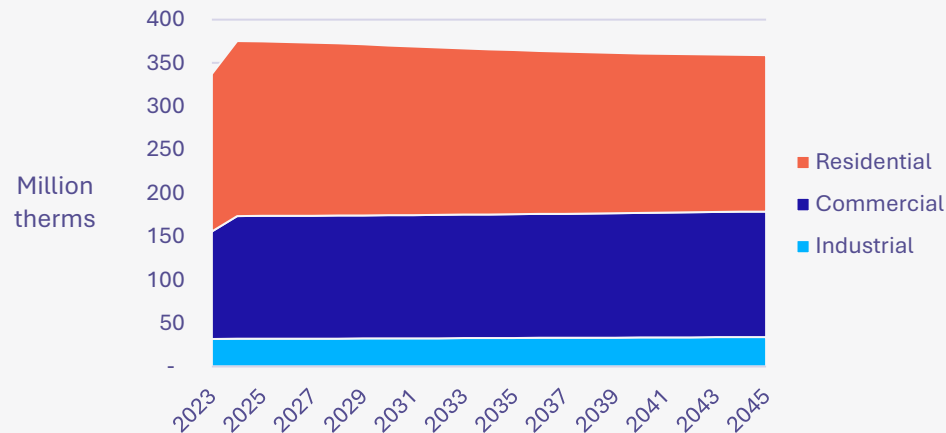


Peoples Gas and North Shore Gas

Peoples Gas Baseline Projection

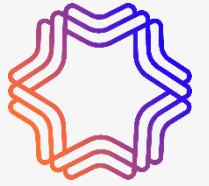


North Shore Gas Baseline Projection

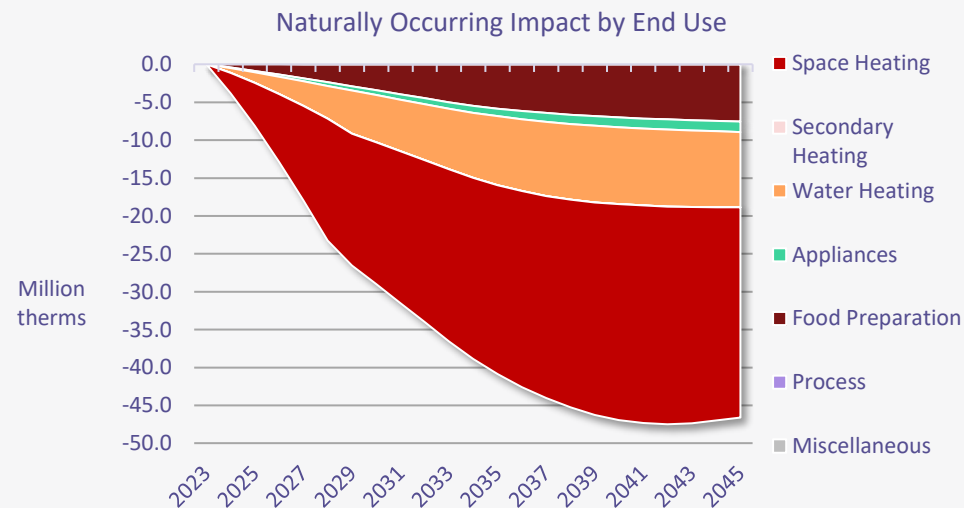
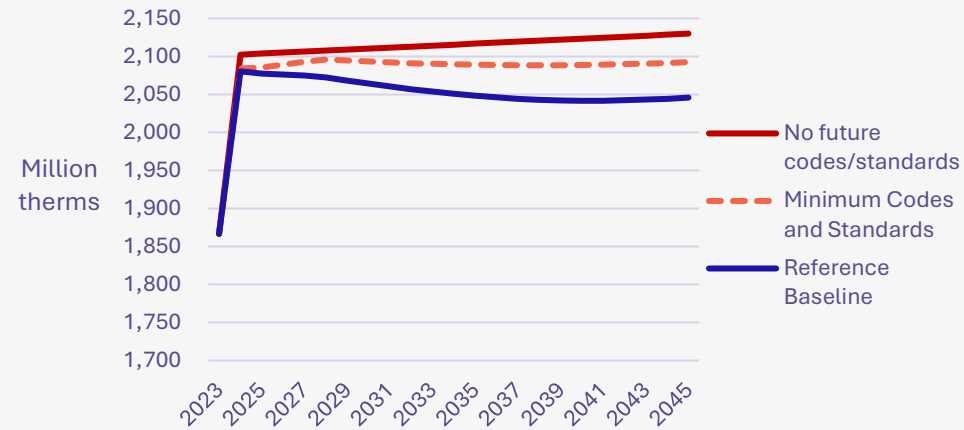


- ✔ Overall use of natural gas is projected to slightly decline from 2024-2045.
- ✔ Customer growth projections were provided by Peoples Gas & North Shore Gas through 2028; AEG extended the trends through 2045
 - Overall market growth is ~0.8% per year
- ✔ Building shells and equipment have some natural improvement over time based on:
 - U.S. Dept. of Energy's Annual Energy Outlook building decay/renovation rates
 - Equipment lifetimes and efficiency codes & standards

Codes, Standards, and Market Impacts



Peoples Gas and North Shore Gas Combined All-Sector Gas Projections

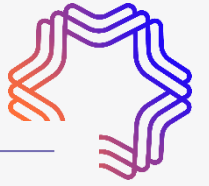


- ✔ The baseline includes the impacts of federal furnace and water heater standards on all equipment turnover, as well as Illinois energy code for new construction and renovations
- ✔ Some customers may also choose above-minimum code equipment at time of replacement or construction
 - Projections for the efficiency of replacement and new equipment is taken from the Dept. of Energy’s Annual Energy Outlook national stock forecast model and ENERGY STAR sales data
 - Estimated potential savings on following slides do not include these “naturally occurring” higher-efficiency installations

**Peoples Gas :
Residential and
Commercial Savings
(Draft)**

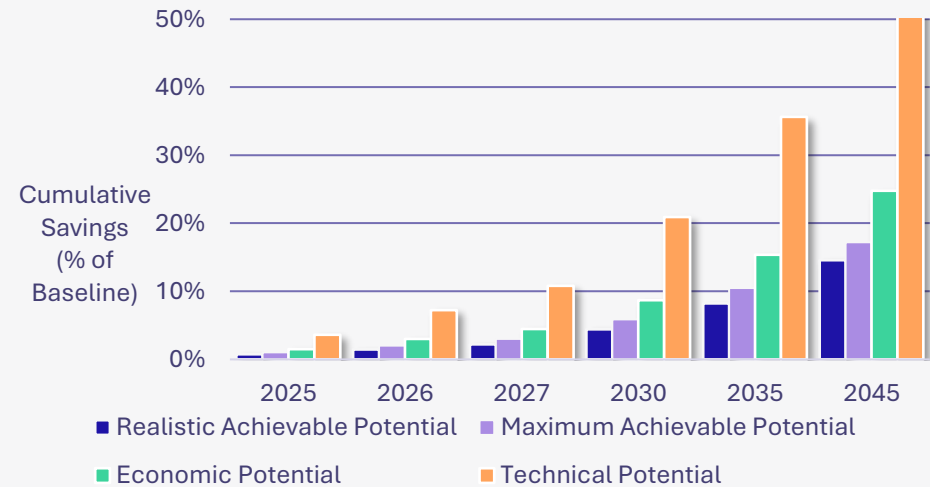
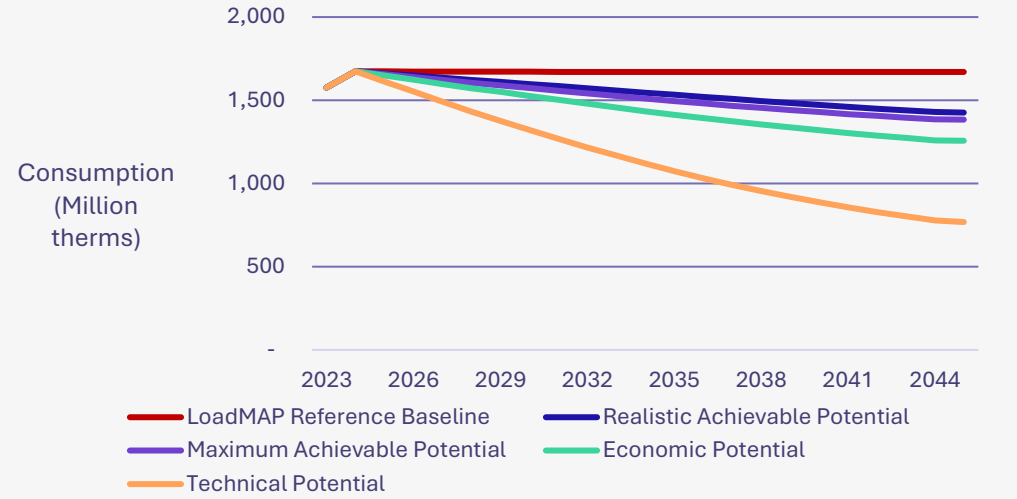


Draft Potential Summary



Peoples Gas – Residential and Commercial Combined Savings

Summary of Energy Savings (Million therms), Selected Years	2025	2026	2027	2030	2035	2045
Baseline Forecast (Million therms)	1673	1673	1672	1671	1669	1670
Cumulative Savings (Million therms)						
Realistic Achievable Potential	12	24	37	73	137	243
Maximum Achievable Potential	17	33	50	98	175	287
Economic Potential	25	50	75	145	257	413
Technical Potential	60	121	181	349	595	902
Energy Savings (% of Baseline)						
Realistic Achievable Potential	0.7%	1.5%	2.2%	4.4%	8.2%	14.6%
Maximum Achievable Potential	1.0%	2.0%	3.0%	5.9%	10.5%	17.2%
Economic Potential	1.5%	3.0%	4.5%	8.7%	15.4%	24.8%
Technical Potential	3.6%	7.2%	10.8%	20.9%	35.6%	54.0%

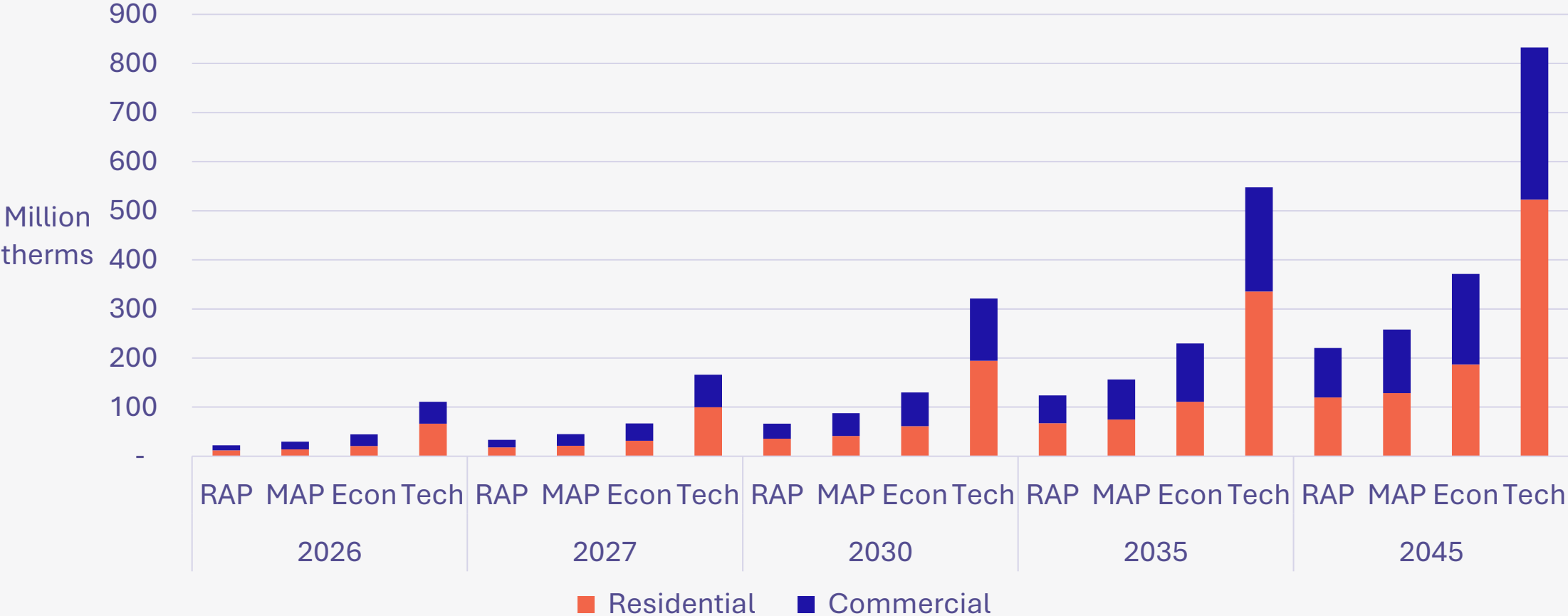


Savings by Sector, Selected years

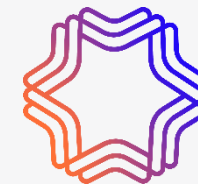


Peoples Gas

Residential and Commercial Savings, Selected Years

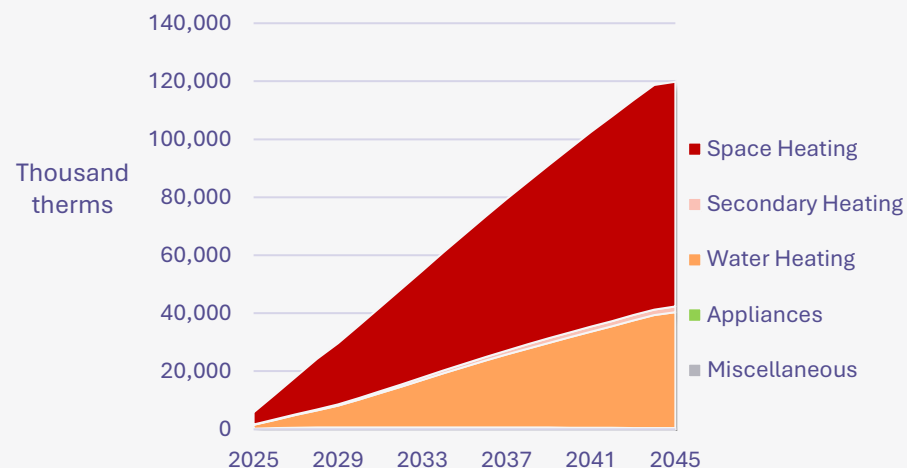


Residential Top Measures



Peoples Gas – Realistic Achievable Potential

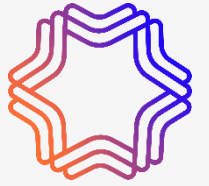
Cumulative Residential Gas Savings by End Use



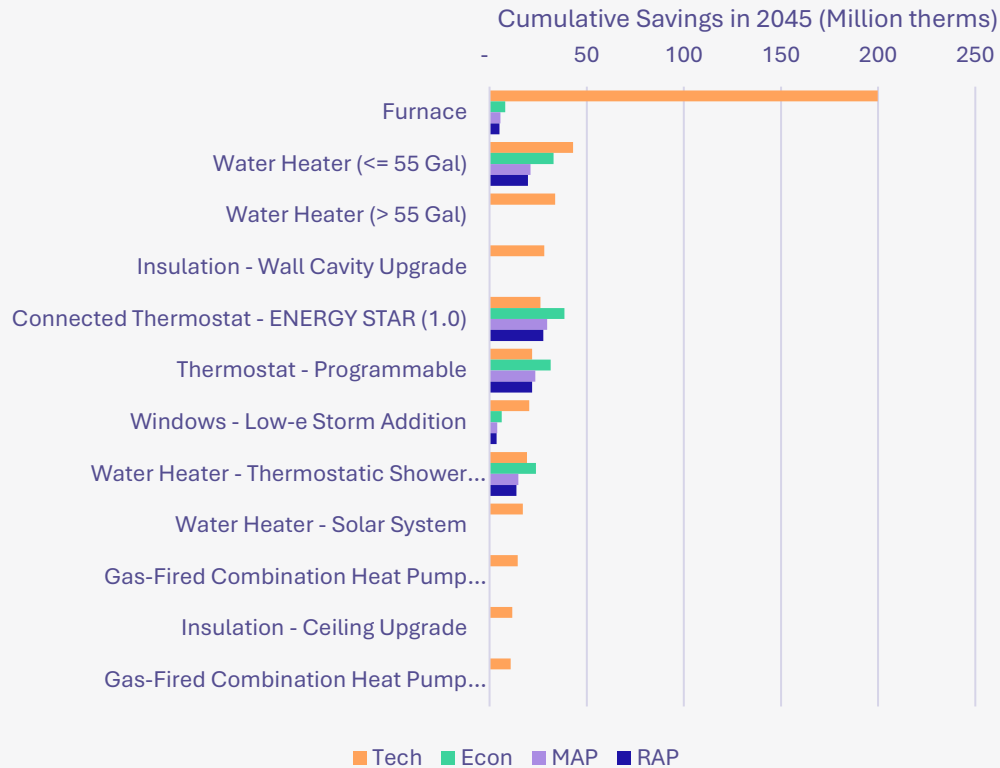
#	Measure / Technology	Cumulative 2027 Savings (Thousand therms)	Cumulative 2035 Savings (Thousand therms)	Cumulative 2045 Savings (Thousand therms)	% of Total
1	Connected Thermostat - ENERGY STAR (1.0)	4,410	15,993	27,677	23.1%
2	Thermostat - Programmable	3,248	12,123	21,855	18.2%
3	Water Heater (<= 55 Gal)	1,250	9,353	19,725	16.5%
4	Water Heater - Thermostatic Shower Restriction Valve	2,142	7,831	13,805	11.5%
5	Building Shell - Whole-Home Aerosol Sealing	980	3,502	5,977	5.0%
6	Home Energy Management System (HEMS)	949	3,350	5,676	4.7%
7	Furnace - AFUE 97%	2,262	4,184	5,033	4.2%
8	Windows - Low-e Storm Addition	0	1,409	3,660	3.1%
9	Insulation - Ceiling Installation	608	2,139	3,614	3.0%
10	Boiler - AFUE 95%	291	1,288	2,643	2.2%
11	Fireplace - >75% FE	234	1,107	1,997	1.7%
12	Combination Boiler - High Efficiency	222	1,049	1,936	1.6%
13	Clothes Washer - CEE Tier 2	184	792	1,450	1.2%
14	Gas Boiler - Steam Trap Replacement	158	571	992	0.8%
15	Laundry - Ozone Treatment	140	485	810	0.7%
16	Gas Boiler - Smart Radiator Controls	121	434	748	0.6%
17	Water Heater - Pipe Insulation	103	370	646	0.5%
18	Windows - High Efficiency (ENERGY STAR 7.0)	14	167	551	0.5%
19	Water Heater - Shower Timer	41	141	233	0.2%
20	Clothes Dryer – CEFD2 3.83	385	385	171	0.1%
Total of Top 20 Measures		17,741	66,672	119,198	99.5%
Total Cumulative Savings		18,035	67,196	119,770	100.0%

- ✔ Residential furnace savings are impacted by effects of new federal standard requiring AFUE 95% beginning in 2029
- ✔ Dual-fuel (aka hybrid) heat pumps, which use a gas furnace as backup for an electric air-source heat pump, were an option in the model

Residential Top Measures

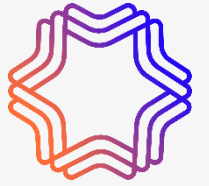


Peoples Gas – Technical Comparison



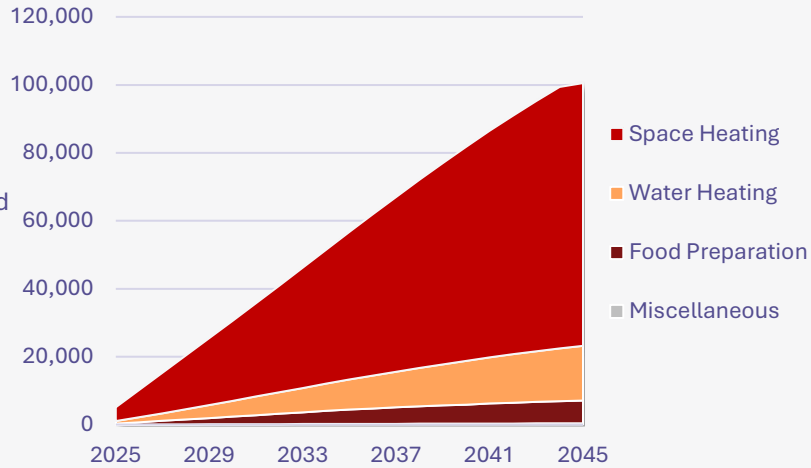
- ✓ Some measures have significant technical potential but do not yet meet the threshold for Economic Potential:
 - Dual fuel (aka hybrid) heat pumps replacing furnaces
 - Combination heat pumps serving both space and water heating needs
 - Upgrading insulation and windows in buildings that are below current code
- ✓ Peoples Gas may continue to monitor these measures or consider them for pilot or custom programs

Commercial Top Measures



Peoples Gas – Realistic Achievable Potential

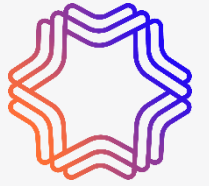
Cumulative Commercial Savings by End Use



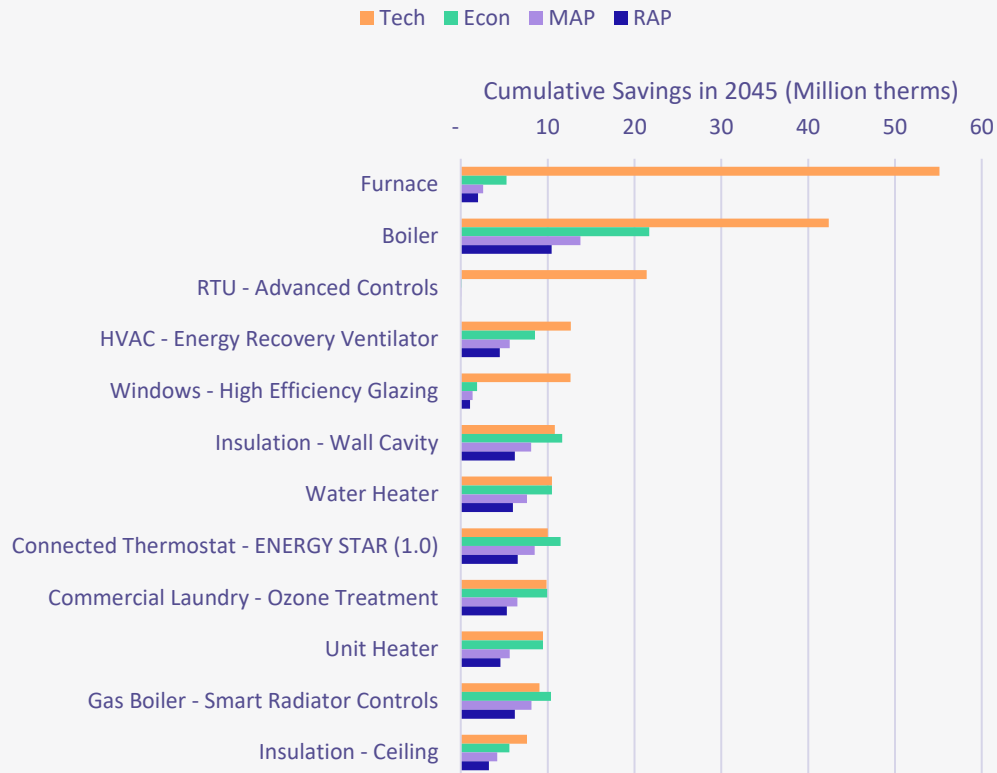
- ✔ While boilers are the #1 measure, more space heat savings come from controls and weatherization than from equipment upgrades
- ✔ Savings account for interaction/overlap between measures like thermostats, automatic radiator controls, and equipment upgrades

#	Measure / Technology	Cumulative 2027 Savings (000 therms)	Cumulative 2035 Savings (000 therms)	Cumulative 2045 Savings (000 therms)	% of Total
1	Boiler – TE 98%	1,369	5,328	10,468	10.4%
2	Connected Thermostat - ENERGY STAR (1.0)	979	3,627	6,547	6.5%
3	Gas Boiler - Smart Radiator Controls	876	3,297	6,201	6.2%
4	Insulation - Wall Cavity	1,036	3,600	6,198	6.2%
5	Water Heater – TE 96%	812	3,321	5,998	6.0%
6	Commercial Laundry - Ozone Treatment	703	2,813	5,274	5.2%
7	Gas Boiler - Insulate Steam Lines/Condensate Tank	809	2,752	4,590	4.6%
8	Unit Heater – Infrared Radiant	704	2,902	4,540	4.5%
9	HVAC - Energy Recovery Ventilator	712	2,546	4,477	4.5%
10	Gas Boiler - Condensate Recovery System	564	2,079	3,789	3.8%
11	Destratification Fans (HVLS)	626	2,167	3,718	3.7%
12	Insulation - Ceiling	560	1,919	3,239	3.2%
13	Ventilation - Demand Controlled	560	1,897	3,142	3.1%
14	Gas Boiler - Thermostatic Radiator Valves	458	1,680	3,092	3.1%
15	Gas Boiler - Steam Trap Replacement	392	1,369	2,382	2.4%
16	Gas Boiler - Hot Water Reset	357	1,253	2,192	2.2%
17	Furnace – TE 90%	278	1,113	1,990	2.0%
18	Infiltration Control - Loading Dock Sealing	284	1,058	1,966	2.0%
19	Gas Boiler - Stack Economizer	300	1,092	1,965	2.0%
20	Boiler – Infrared Burners	296	1,169	1,863	1.9%
Total of Top 20 Measures		12,676	46,982	83,631	83.2%
Total Cumulative Savings		15,268	56,709	100,516	100.0%

Commercial Top Measures



Peoples Gas – Technical Comparison



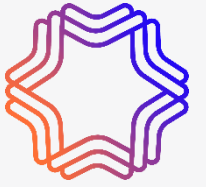
✓ As in Residential, some measures with large technical potential do not yet meet the threshold for Economic Potential, including heat pump replacements for furnaces

- ✓ Other measures with high technical but much less economic potential include:
- Boiler upgrades to condensing systems in several segments
 - Advanced controls for rooftop packaged HVAC systems
 - High efficiency window upgrades

North Shore Gas Residential and Commercial Savings (Draft)

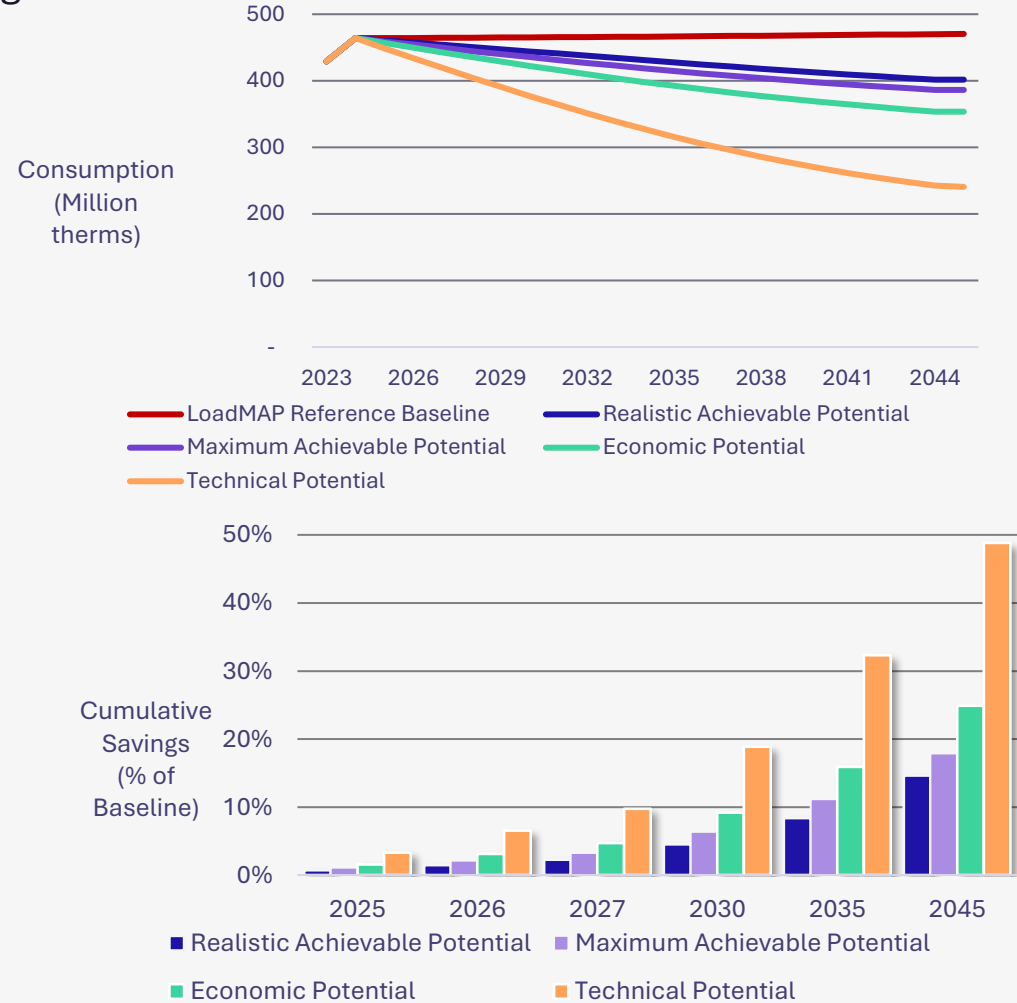


Draft Potential Summary



North Shore Gas – Residential and Commercial Combined Savings

Summary of Energy Savings (Million therms), Selected Years	2025	2026	2027	2030	2035	2045
Baseline Forecast (Million therms)	464	464	464	465	467	470
Cumulative Savings (Million therms)						
Realistic Achievable Potential	3	7	11	21	39	69
Maximum Achievable Potential	5	10	15	30	52	84
Economic Potential	7	14	22	43	74	117
Technical Potential	15	30	45	88	151	230
Energy Savings (% of Baseline)						
Realistic Achievable Potential	0.7%	1.5%	2.3%	4.5%	8.4%	14.6%
Maximum Achievable Potential	1.1%	2.1%	3.2%	6.4%	11.2%	17.9%
Economic Potential	1.6%	3.1%	4.7%	9.2%	15.9%	24.9%
Technical Potential	3.3%	6.5%	9.8%	18.9%	32.3%	48.9%

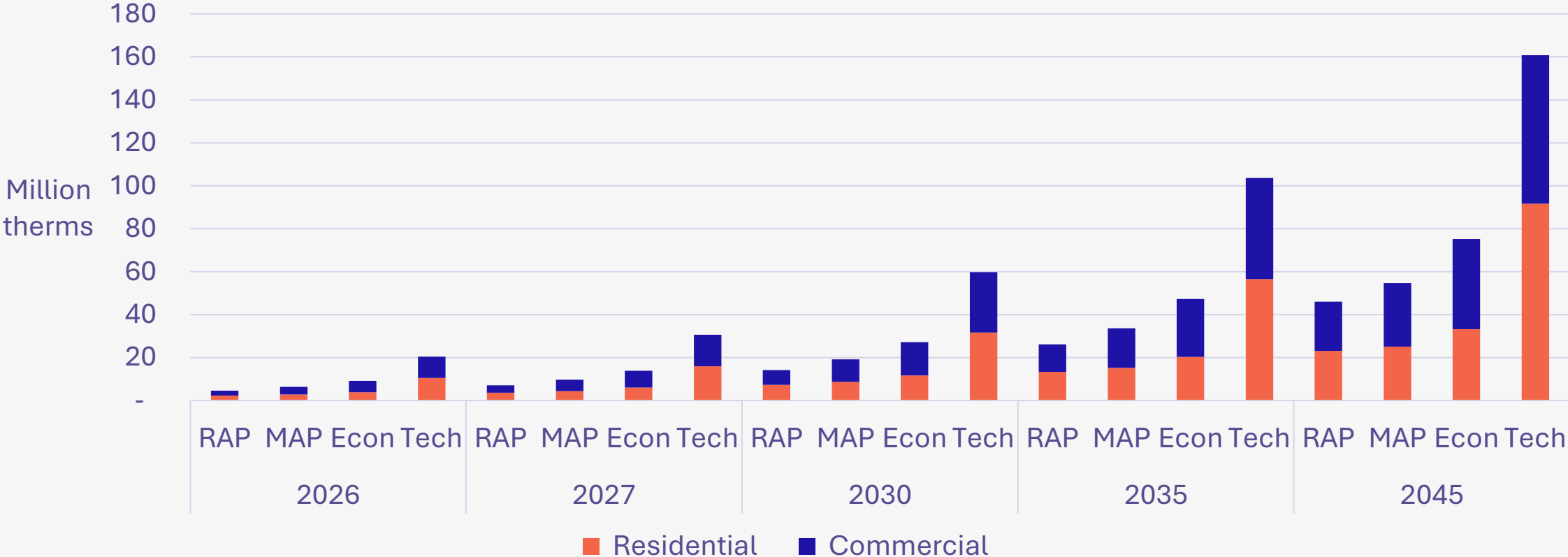


Savings by Sector, Selected Years

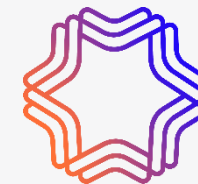


North Shore Gas

Residential and Commercial Savings, Selected Years

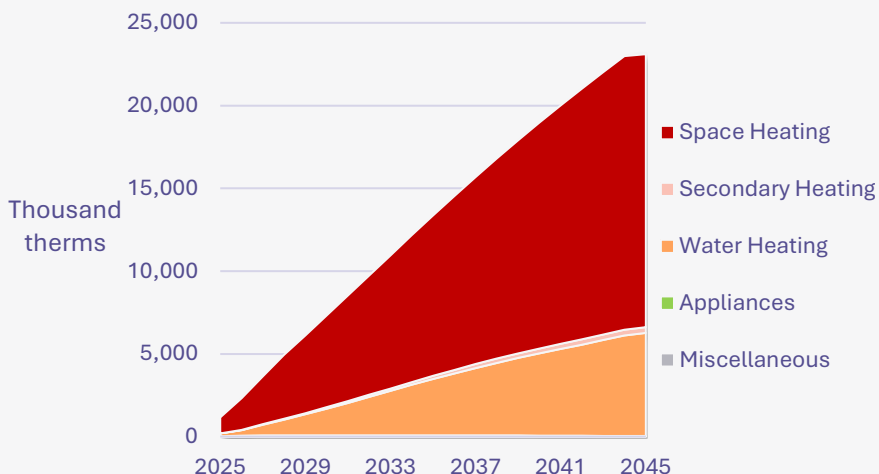


Residential Top Measures



North Shore Gas – Realistic Achievable Potential

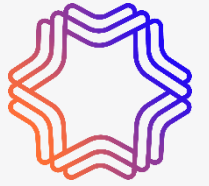
Cumulative Residential Gas Savings by End Use



#	Measure / Technology	Cumulative 2027 Savings (Thousand therms)	Cumulative 2035 Savings (Thousand therms)	Cumulative 2045 Savings (Thousand therms)	% of Total
1	Connected Thermostat - ENERGY STAR (1.0)	988	3,629	6,336	27.4%
2	Thermostat - Programmable	724	2,698	4,810	20.8%
3	Water Heater (<= 55 Gal)	131	1,577	3,111	13.5%
4	Home Energy Management System (HEMS)	323	1,142	1,920	8.3%
5	Water Heater - Thermostatic Shower Restriction Valve	285	1,006	1,733	7.5%
6	Insulation - Ceiling Installation	212	759	1,283	5.6%
7	Furnace – AFUE 97%	489	929	1,153	5.0%
8	Building Shell - Whole-Home Aerosol Sealing	128	456	767	3.3%
9	Combination Boiler - High Efficiency	90	381	675	2.9%
10	Fireplace – >75% FE	39	194	346	1.5%
11	Boiler – AFUE 95%	34	160	340	1.5%
12	Clothes Washer - CEE Tier 2	24	104	187	0.8%
13	Gas Boiler - Steam Trap Replacement	18	67	117	0.5%
14	Gas Boiler - Smart Radiator Controls	15	55	95	0.4%
15	Laundry - Ozone Treatment	10	34	53	0.2%
16	Windows - High Efficiency (ENERGY STAR 7.0)	1	13	50	0.2%
17	Clothes Dryer – CEFD2 3.83	80	80	35	0.2%
18	Home Energy Reports	24	32	30	0.1%
19	Water Heater - Pipe Insulation	5	16	28	0.1%
20	Water Heater - Shower Timer	5	16	25	0.1%
Total of Top 20 Measures		3,626	13,348	23,096	100.0%
Total Cumulative Savings		3,629	13,351	23,097	100.0%

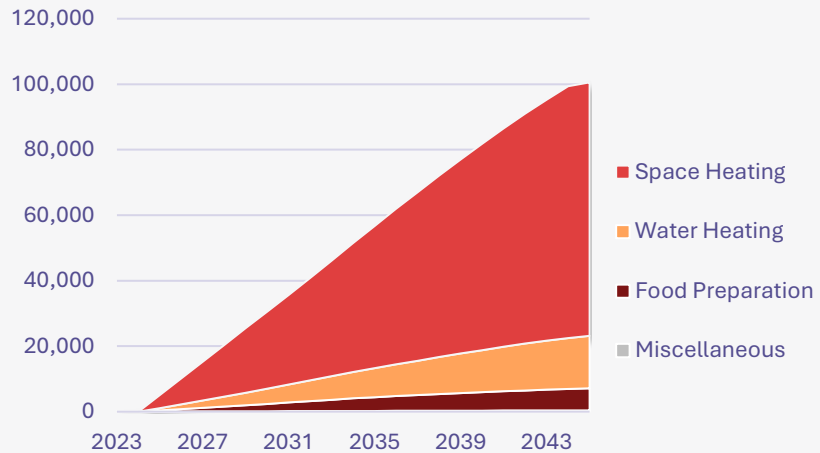
✔ Measure mix is similar to Peoples Gas, however North Shore Gas has a more homogenous, mostly single-family (>99.5%) residential segment which shifts some measure ranking around

Commercial Top Measures



North Shore Gas – Realistic Achievable Potential

Cumulative Commercial Savings by End Use



#	Measure / Technology	Cumulative 2027 Savings (000 therms)	Cumulative 2035 Savings (000 therms)	Cumulative 2045 Savings (000 therms)	% of Total
1	Boiler – TE 98%	281	1,105	2,203	9.6%
2	Destratification Fans (HVLS)	274	964	1,696	7.4%
3	Insulation - Wall Cavity	259	910	1,592	6.9%
4	Connected Thermostat - ENERGY STAR (1.0)	231	862	1,572	6.9%
5	Gas Boiler - Smart Radiator Controls	170	644	1,219	5.3%
6	Unit Heater – Infrared Radiant	176	736	1,171	5.1%
7	Water Heater – TE 96%	144	593	1,084	4.7%
8	Commercial Laundry - Ozone Treatment	134	539	1,022	4.5%
9	Insulation - Ceiling	171	594	1,020	4.5%
10	HVAC - Energy Recovery Ventilator	146	523	924	4.0%
11	Gas Boiler - Insulate Steam Lines/Condensate Tank	159	544	918	4.0%
12	Gas Boiler - Condensate Recovery System	108	399	734	3.2%
13	Ventilation - Demand Controlled	112	377	615	2.7%
14	Gas Boiler - Thermostatic Radiator Valves	89	328	609	2.7%
15	Infiltration Control - Loading Dock Sealing	80	303	568	2.5%
16	Furnace – TE 90%	72	290	531	2.3%
17	Broiler – Infrared Burners	75	300	485	2.1%
18	Gas Boiler - Steam Trap Replacement	78	274	481	2.1%
19	Gas Boiler - Hot Water Reset	69	245	433	1.9%
20	Gas Boiler - Stack Economizer	58	214	389	1.7%
Total of Top 20 Measures		2,886	10,746	19,263	84.1%
Total Cumulative Savings		3,438	12,836	22,912	100.0%

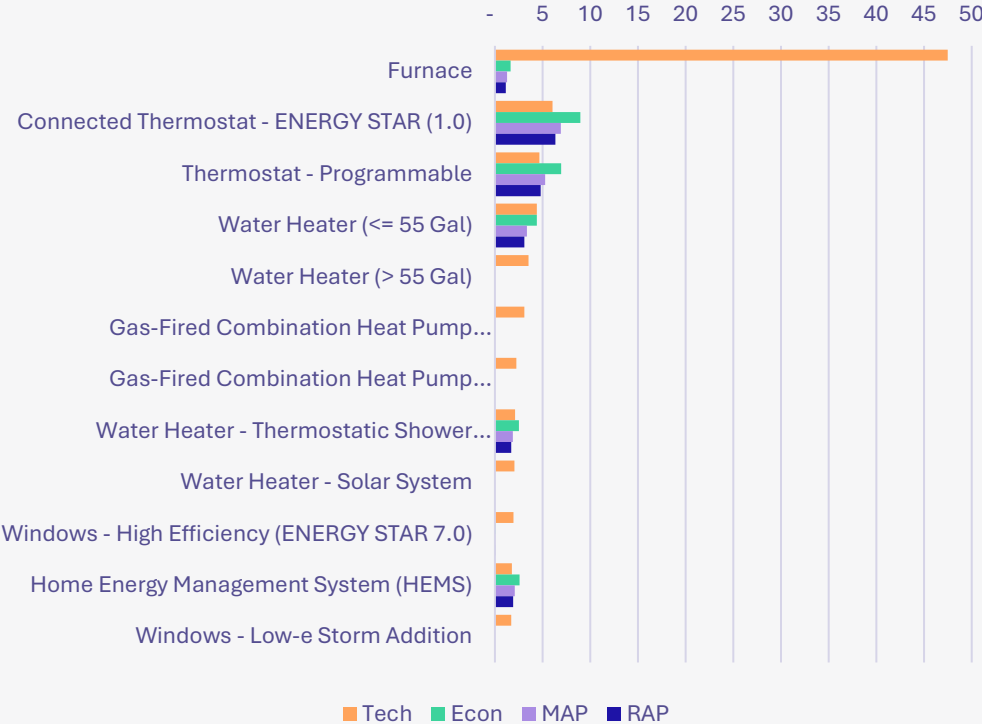
- ✔ Different segment mix from Peoples Gas moves some measures down in ranking, such as Connected Thermostats
- ✔ However, other than ranking, the makeup of the top measures remains similar – Boilers at the #1 position with space heating controls and weatherization contributing the majority of savings

Technical Comparison

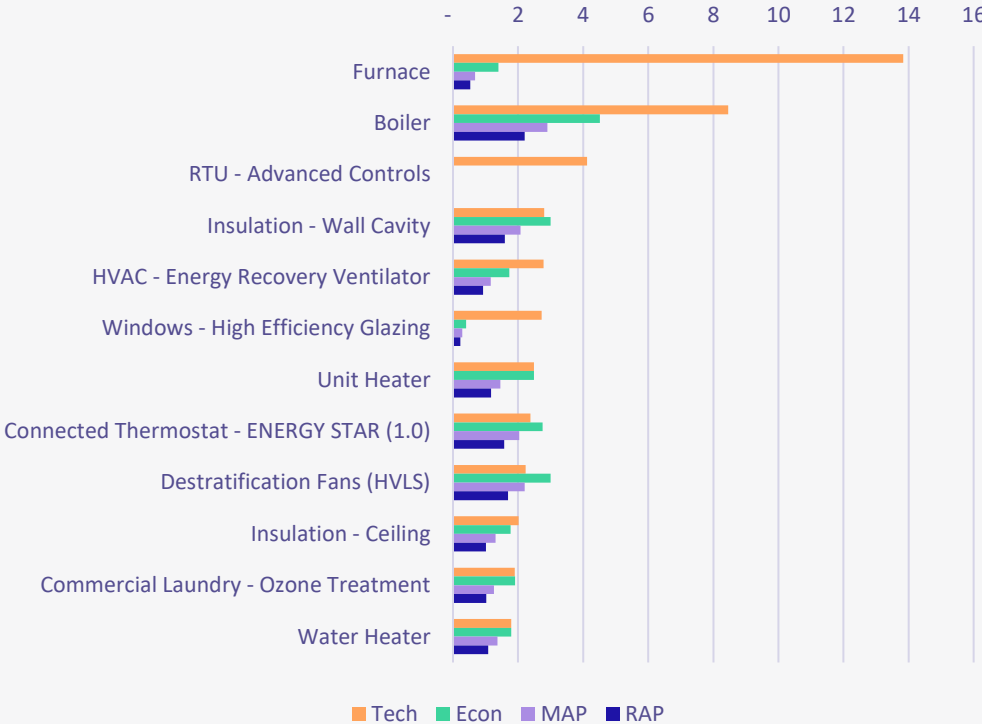
North Shore Gas



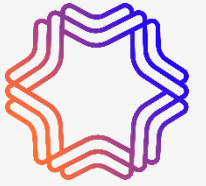
Residential Cumulative Savings in 2045 (Million therms)



Commercial Cumulative Savings in 2045 (Million therms)

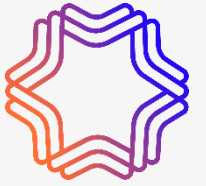


Key Takeaways



- ✔ Upcoming federal equipment standards changes will reduce customer loads, but constrain opportunities for cost-effective program savings
- ✔ The majority of potential has shifted from equipment upgrades to building shell and control systems
- ✔ Heat pump technologies and advanced control systems have promising technical potential, but require targeted strategies
- ✔ Custom projects may also provide a path to more savings

Planned Scenarios



- ✔ Once the reference case is finalized, AEG will create duplicate model sets that vary the foundational input assumptions:
- ✔ **Electrification Scenario**
 - Will explore the impact on gas loads and savings potential
 - All-electric new construction option
- ✔ **Avoided Emissions Sensitivity**
 - Removes the carbon value from avoided costs to assess what measures are cost effective purely from their gas efficiency savings
- ✔ **Climate Future Scenario**
 - Replaces the 20-year Normal weather data with projected Cooling and Heating Degree Days representing changes in climate

Thank You!

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Supplemental Slides

Avoided Costs



Values escalate according to projections for carbon and gas commodity costs

